

Acute Conditions in Neurology and Disorders of Consciousness

Introduction

Neurology is becoming a predominantly diagnostic field with a significant development of care for **acute conditions**. In addition to the diagnostic progress given mainly by neurological applications of new **imaging methods** the possibilities of timely and effective treatment have also significantly expanded. Thus, in neurological practice today we encounter a rich range of patients brought by the ambulance service with acute neurological symptoms, often accompanied by **disorders of consciousness** (see table). This article is only a summary, a list of conditions that acutely endanger the patient's health and subsequent quality of life. It is the duty of every doctor to be able to recognize the causes of these conditions, to adequately secure the patient and to send them to the appropriate specialist workplace.

Overview of acute conditions in neurology

Classification according to disease manifestations
<ul style="list-style-type: none">▪ disorders of consciousness▪ disorders of speech and other cortical functions▪ convulsive seizures and other seizures▪ acute focal symptoms - movement disorders, sensation, sensory functions▪ acute state of muscle weakness▪ acute abnormal movements (<i>dyskinesia</i>)▪ acute loss of momentum (<i>akinesia</i>)
Classification according to disease causes
<ul style="list-style-type: none">▪ intracerebral hemorrhage▪ cerebral ischemia▪ subarachnoid hemorrhage▪ venous thrombosis▪ bacterial infections - meningitis, abscess▪ viral infections▪ acute spinal cord injury▪ craniocerebral trauma▪ myasthenic crisis▪ acute inflammatory polyneuropathy▪ periodic paralysis▪ epilepsy▪ metabolic and endocrine disorders▪ toxic and drug conditons

When an acute patient arrives at a medical facility, some principles of care are considered basic: the **diagnostic balance takes place simultaneously with the examination and provision of vital functions**. The main purpose of the activity is the **survival of the patient** with the **smallest possible residual deficit** and the **smallest possible subsequent morbidity**, which should ensure the basic procedure. The following text describes in more detail the basic clinical manifestations, diagnostic and treatment procedures for disorders of consciousness. Individual differential diagnostic options and specific diagnostic and treatment procedures will be the topic of further articles.

Consciousness and its Disorders

Consciousness and alertness are prerequisites for normal cognitive and cortical functions. Disorders of consciousness are divided into **quantitative** and **qualitative** (tab.). Further division into different degrees of quantitative disturbance is artificial, individual categories often form a smooth transition. In clinical practice, it is better to express the **severity of a quantitative disorder of consciousness** using an appropriate **scale** (usually Glasgow Coma Scale - *Tab. 3.*) and a **verbal description** of the manifestations (*Tab. 4.*).

Division of Consciousness Disorders

Quantitative	Qualitative
somnolence	resurrection
sopor	-
coma	delirium

Depth of Unconsciousness –
Glasgow Coma Scale

Eye Opening	
spontaneous	4
after being addressed	3
after pain	2
absent	1
The best motor response	
will meet the challenge	6
targeted at an algic stimulus	5
fast escape flexion	4
abnormal flexion	3
extension	2
none	1
The best Verbal Answer	
oriented adequate	5
confused, inadequate	4
isolated random words	3
incomprehensible sounds	2
none	1

Causes of Disorders of Consciousness

Structural	Non-Structural
<ul style="list-style-type: none"> ▪ Craniocerebral Trauma ▪ vascular lesions - ischemia, bleeding ▪ infectious encephalitis ▪ Tumor or other intracranial expansion - <i>intracranial hypertension syndrome, „mass effect“, oppression of key structures)</i> 	<ul style="list-style-type: none"> ▪ hypoxia ▪ electrolyte imbalance ▪ endocrine disorders ▪ vascular system disorders ▪ toxic ▪ infectious - systemic (septic condition) ▪ Deficiency (thiamine etc.) ▪ organ failure ▪ hypo- or hyperthermia ▪ psychogenic

Note: An epileptic seizure can be an immediate cause of impaired consciousness for both structural and non-structural causes.

Examination procedure in an Unconscious Patient

In an unconscious patient, the **classic neurological examination scheme is unusable**. The priority is to **maintain or restore vital functions** according to the principles of the procedure "Airway - Breathing - Circulation" (ABC), i.e. **to relax the airways**, evaluate and **ensure respiration and blood circulation**. An essential part of the basic measures is to ensure a quality **venous access** and **laboratory examinations** - see the diagram on the *Algorithm of the procedure in an acute neurological patient*. Before proceeding to a detailed neurological examination, **we pay attention to the warning signs**, which testify to serious life-threatening conditions requiring urgent measures and transport to the intensive care unit (ICU) as soon as possible.

Warning Signs in a Patient with Impaired Consciousness

Symptoms of Respiratory Insufficiency

Many acute neurological conditions progress to the picture of acute respiratory insufficiency. Thus, not only **central involvement** (intracranial hypertension with cone symptoms, intoxication, metabolic encephalopathies, strain damage, etc.) may manifest, but it can also lead to **spinal** and **peripheral respiratory disorders**, such as myasthenic crisis or acute inflammatory demyelinating polyneuropathy. In addition, acute neurological conditions are often complicated by severe **bulbar symptoms**, where inability to swallow and cough and tongue engagement lead to secondary respiratory failure.

The general symptoms are:

- cyanosis or pale or gray discoloration, marble acres

- tachypnea > 35 breaths / min., small volumes!
- bradypnea (less than 10 breaths / min.) to apnea
- increased respiratory effort - "pulling" (difficult inspiration with the involvement of auxiliary respiratory muscles and pulling in juguls)
- ↓ PaO₂ < 9 kPa, ↑ PaCO₂ > 6,5 kPa
- ↓ fVC (forced vital capacity) - especially in conditions of muscle weakness + sweating, anxiety, ↑ heart rate, paradoxical breathing

(patient with fVC 800–1000 ml - ICU monitoring, <500 ml - consideration of intubation and artificial lung ventilation)

Manifestations of Circulatory Centralisation

As the first signs of the development of shock, along with hypotension - **sweating , dizziness , cold acres , tachycardia , oliguria** to anuria.

Blood Pressure Abnormalities

- **Hypotension** - is an urgent condition, it arises from the disparity between the volume of the vascular system and its content (reduction of vascular tone with normal intravascular volume, dysregulation of the vascular compartment, reduction of cardiac output, hypovolemia).

The first aid is to apply **500 ml of isotonic solution** while searching for the cause. Further care falls within the scope of ICU care. **Attention!** Crystalloid solutions (eg physiological saline) have only a temporary effect on the increase in intravascular volume and rapidly penetrate from the vascular bed to other compartments.

- **Hypertension** - is a traditionally feared condition, but **does not require nearly as rapid a solution as hypotension**. Elevated blood pressure is a common correlate of brain damage and is often **the result rather than the cause** of an acute neurological situation (stress response with increased peripheral resistance, concomitant pain, autoregulatory response to maintain cerebral perfusion pressure). It is true that a **rapid decrease in blood pressure** (with the exception of hypertensive encephalopathy) **has a negative effect on the outcome**.

TKS> 220 mmHg can generally be considered at **risk for** systolic blood pressure (BPD) in neurological patients . Of course, it is necessary to assess the overall condition of the patient and consider the possibility of myocardial damage by ischemia at high left ventricular load due to increased peripheral vascular resistance. In the treatment of such a condition, the basic measure is **analgesia** and **sedation** of the patient, and only the second measure is the **administration of hypotensives**, initially orally.

Cardiac Abnormalities

They are **a very common complication** of an urgent neurological condition and, conversely, many pathological neurological conditions can arise due to heart rhythm disorders or decompensation of heart failure.

- The most common arrhythmia in neurological patients is **sinus tachycardia** (the clear limit is a heart rate **HR> 120 / min.**). Therapy consists in determining and treating the cause (pain, anxiety, hypoxia, hypotension, pulmonary complications, development of shock, cardiac causes) and falls within the competence of the ICU (depending on the duration and in addition up to HR above 160-180 / min. reduction in cardiac output)
- **Sinus Bradycardia** (HR < 40/min.) **Tends to have extracardiac causes** in neurological patients , and is often correlated with brainstem damage. The basic treatment for normotensive patients is the administration of 0.5 mg atropine intravenously and the provision of a monitored bed.
- **Atrial Fibrillation and flutter** are acute conditions that patients have suffered from before, or are new conditions associated with **extracranial complications** . Therapeutically, we intervene in the first phase only within the stabilization of the transfer rate, the solution of these complications is possible only on the monitored bed.
- In contrast, **ventricular tachycardia** with broad QRS complexes is an urgent condition, where due to the **risk of transition to ventricular fibrillation**, it is **necessary to start therapy immediately** (lidocaine, trimecaine) while providing a monitored bed.
- **Ventricular Extrasystoles** are often observed, but endanger the patient by switching to ventricular tachycardia at a frequency greater than 15 / min. The treatment of most conversion disorders falls within the competence of the cardiologist and can usually be dealt with delay.

Self-Neurological Examination

The possibilities of neurological examination in an unconscious patient are significantly limited.

- First of all, it is necessary to determine the **depth of the consciousness disorder** using the Glasgow Coma Scale (GCS, see table) . GCS is a natural part of the examination, although especially in patients with focal brain damage, the detectability is reduced by impaired fatal functions and motor skills. **The patient with GCS <8 is unconscious**, so due to the threat and possible loss of basic reflexes , he is usually indicated for **immediate airway securing by tracheal intubation**.
- **It is also important to look for focal deficits** in a rapid neurological examination . It is especially important to assess the nature and symmetry of the response to an algic stimulus.

- This is followed by an examination of the **brainstem** with an evaluation of the oculomotor innervation, including the condition of the pupils and **pupillary reflexes** , **oculocephalic reflexes** , **masseter** , **corneal** and **nasopalpebral** or **vascular reflexes** . With a negative oculocephalic reflex, we can examine **the caloric vestibuloocular reflex**. Comatose patients tend to have typical **bulb positions** (horizontal or vertical divergence, permanent bulb deviation downwards) or characteristic spontaneous **eye movements** (wandering conjugated bulb movements, **ocular bobbing**, **ocular dipping**, **opsoclonus**).
- When the patient breathes spontaneously, we monitor the **depth and rhythm of breathing**. If a tracheal cannula is inserted, we can examine the **cough reflex**.
- We monitor their position and spontaneous movements on the **limbs** , notice typical postures (**decortication**, **decerebration**), evaluate **muscle tone and its symmetry** (eg **asymmetric hypotension** of the limb may be the only manifestation of fresh hemiparesis in an unconscious patient), determine **reflexes** and the presence of pathological phenomena (spastic pyramidal phenomena, meningeal symptoms).

The "Glasgow Outcome Scale" (tab.) Can be used as a **measure of the final condition** after treatment of a patient with impaired consciousness (eg after craniocerebral trauma) .

Final Evaluation of the Patient - Glasgow Outcome Scale

Good Adjustment: Able to return to Work	5
Mild Disability: able to live without assistance, unable to return to work	4
Severe Disability: obeys instructions, unable to live without assistance	3
Vegetative state: unable to interact with the environment, not responding	2
Dead	1